THE SEASQUARE

By GEORGE A. WILSON, JR. . . . The author is one of the foremost designers of seaplanes and flying boats that really operate well from the water. The "Seasqure" is an economy size craft for 3-channel radios.

• The Seasquare is a functional Flying Boat for novices and experts. Powered with an OS.19, and into about a 5 mph breeze, it is up on the step as soon as full power is applied, and in the air within 20 to 30 feet.

With the CG about 1/2 inch ahead of the location shown on the plan, flying characteristics are good and compare favorably with the performance of trainers with flat-bottom wings.

The hatch is thoroughly waterproof. But, we do admit to putting a patch of Silray over the nose-gear entrance hole to keep water out of the hull. Don't forget to put the main gear screws into the blind nuts in the hull before you go waterflying!

KITTING

If you are an experienced scratch builder you will be acquainted with the savings in time that result from kitting. If not, let me urge you strongly to cut out ribs, bulkheads, hull sides, etc., etc. before you start construction. This process should even include cutting the wing spars and leading-edges to length and cutting as much of the wing and rudder sheeting to size as can be done without actual fitting. This process will familiarize you with the plans, and when construction begins, it will happen easily and quickly; in fact, faster than if you were assembling a commercial kit, since you will be more familiar with the parts.

Kitting is expedited through the use of a band (or jig) saw and a fine tooth, hollow ground circular saw. Stack the ribs and cut them all at one time. Trim the wing spars and sheeting to length with one pass through the circular saw. With a little thought, kitting will go quickly and easily, even if you don't have the aid of power tools.

HULL CONSTRUCTION

The hull is built top-down on your work surface. The top is cut from two medium 1/8 x 3 x 36 balsa sheets and a separate 1/8 x 3 x 6 bow section. The hull bulkheads are added after the three pieces that form the top have been glued together and pinned to the work surface (Save the hatch cut-out and use it as the inside layer of the hatch; the outer layer of the hatch should have its grain at right angles to the inner layer.).

The bulkheads through which the Nyrod control tubing passes should be stacked and the holes cut for the Nyrod by drilling through the stack of bulkheads in one pass. A 3/16 in. brass tube, sharpened on the inside, makes a fine balsa drill for this purpose. If you plan to include land gear, install blind nuts in the nose gear bulkhead and main gear plywood mount (The nose gear bulkhead may be made of balsa and the main gear omitted if you don't plan to make your Seasquare convertible for land operation.).

Install the bulkheads. Install the triangular plywood pieces at the hatch corners. The hull sides are made from 3/32 x 3 x 36 medium-hard balsa with pieces spliced on to them at the bow as shown on the plan. *Don't shorten* the 36-inch lengths used for the sides. The extra apparent length is exactly what is needed to compensate for the curvature at the aft end of the hull. Install the sides and the bottom stringers. Add the doublers at the rear wing hold-down dowel locations.

Give the inside of the hull a coat of dope or diluted Hobby-Poxy (1:1 with isopropal alcohol or thinner). Coat one side of the material to be used for the hull bottom while you are at it.

Install the Nyrods, using epoxy at the points where they pass through the hull side (rudder) and top (elevator). Do not cement the Nyrods to the bulkheads . . . leave them free to expand and contract. Install the center and aft rudder spars, making sure they are right angles to the hull top and in line with each other. Install the hull bottom with the grain running crosswise. Install the floor inside the area under the hatch and add the 1/16 x 3/16 pine chine strips. The pine (or real hard balsa) will bend easily at the bow end if you saw it half-way through (from top to bottom) with a razor saw at 1/8 to 1/4 inch intervals.

The hatch is made of two layers of 1/8 balsa sheet, doubled, with their grain running at right angles. The bottom is best made from the piece cut out of the hull top . . . it fits exactly. The top (grain crosswise) overlaps 1/4 inch all around and is rounded after it is glued to the bottom. Blind nuts are used under the triangular corner pieces and a 4-40 x 1/2 inch screw at each corner holds the hatch in place. Use a piece of 1/8 x 1/8 inch *closed cell* sponge rubber as a gasket. Attach the gasket to the hatch cover using Pliobond cement.

WING AND MOTOR PYLON

The wing ribs are in two pieces; the triangular trailing edge sections may be cut from scrap balsa. A continuous aft spar was included in the wing to make it easy to adapt to ailerons. The trailing edge behind the spar can be removed and solid balsa ailerons substituted. When you cut the ribs, save the curved scrap pieces that come from the leading-edge ends; these will be used when the bottom sheeting is glued in place.

Pin down over the plan (wax paper first) the bottom leading and trailing-edge sheeting. Mark the rib locations on the sheeting and lightly draw lines at each rib location to help align the ribs when they are installed. Add the bottom cap strips, center sheeting and lower main spar. Install the ribs (except the center ribs each side of the pylon), the top main spar, rear spar and sub-leading edge.

The bottom sheeting is glued to the curved bottom part of the ribs and the sub-leading edge with the aid of the curved pieces you saved (I hope) when you cut the ribs. Apply glue to the sheeting under the ribs and sub-leading edge, and then slide the curved scrap pieces under the sheeting *at* and *between* each rib location. This will lift the sheeting snugly against the bottom of the ribs. At this point, cut the central ribs to accept the dihedral braces. Trim the sub-leading edge and aft spar flush with the tops of the wing ribs and install the rear sections of the wing ribs including those at the center. Allow this much of the wing assembly to dry well before it is unpinned from the work surface.

Make the dihedral joint by pinning one half of the wing to your work surface, gluing the dihedral braces in place in both halves of the wing and allowing the assembly to dry with a block supporting the end of the wing which is not pinned down. Make sure the assembly is true at this point; don't build in any warps. When dry, add the 1/4 inch plywood center section of the motor pylon, using as a guide a block of scrap balsa cut to the dihedral angle. Add the center ribs and again let things dry. Before adding the top sheeting, dope or epoxy the inside the wing structure, including the inside of the top sheeting. The top sheeting, cap strips, tip block, and pylon faces complete the wing assembly. Don't forget to taper the trailing edge of the rear, top sheeting before it is installed. This is easily done using a razor plane.

The motor bearers are attached to the pylon by means of medium-hard balsa blocks cut as shown on the plan. These blocks are hollowed out to fit a round tank, or a flat tank may be used without hollowing. Clamp the motor bearers and attachment blocks together while the glue is drying. The fairing at the aft end of the pylon behind the tank can be omitted or made as fancy as you desire. Its effect on flight charateristics will be very little.

TIP FLOATS

The tip floats are built upside down on your work surface. Pin down the 1/8 top former, and space the 1/16 mid-former above it, using 3/4 in. scrap blocks. Cut to length and install the vertical stringers and glue them in place in the top and mid-formers. When dry, add the half-former. Dope or epoxy (see directions for hull) the inside of the structure and one side of the sheet to be used for side covering, the plywood and balsa sheet bottom pieces. Apply 3-inch section of the side covering about half-way from front-to-back and on sides of the floats. Trim the remaining side covering to approximate size and install it. Finish, trim, and sand the rear bottom, then install the plywood aft-bottom. Rough out the balsa fore-bottom block. Now finish, trim, and sand the floats all over. The fore-bottom block is not rounded at its chine edges; leave the chines square in keeping with the overall square motif.

The floats are attached to the wing after the model has been covered. The floats may be glued permanently to the wings or attached with double sided adhesive material. Double sided tape was used on the original Seasquare and it works real well.

RUDDER AND STABILIZER

The remaining frame pieces and dorsal fin are added to the vertical fin, and a piece or two of flat stock pinned to the frame work to assure that the fin dries flat and true. Dope or epoxy the structure and the inside of the sheeting material. Add the sheeting with grain vertical. Add the doublers and blind nuts to the stabilizer saddle and then glue it to the vertical fin, checking carefully to see that it is at right angles with the vertical fin. When dry, add the triangular saddle supports and fair them at their leading and trailing edges.

The rudder and elevator are made from medium-soft balsa sheet. The water rudder and its mounting parts on the air rudder are from 1/16 plywood as shown on the plan. The central horns are added after covering is completed. Be sure to remove the covering where they are attached and epoxy them directly to the wood.

The stabilizer is a simple, flat structure. Dope or epoxy the structure on the inside before it is covered. Use plenty of plasticizer in the dope used on the stabilizer to avoid over-tightening and warping. The author uses castor oil as a plasticizer. Four drops to the ounce is normal; six to eight drops per ounce can be used in this case. If too much plasticizer is used, drying will be very slow; it's best to check a sample for drying properties before you dope a surface on the model.

LANDING GEAR

As a seaplane, the hull and tip floats function conventionally. Planing blocks were added at the step to provide minimum water contact at the moment before take-off. They also protect the hull when it is sitting on the beach. The long water rudder is necessary to assure that the model tracks straight when it is planing on its flat hull. If the rudder comes out of the water at too low a speed, Seasquare will wander about until it has speed enough for the vertical fin and rudder to take over.

As a land plane, it may be necessary to lengthen the main and nose gears to prevent the hull from being damaged on rough landing. The length can be adjusted to the builder's own taste.

Don't forget to plug the nose gear hole and put screws into the blind nuts used to secure the main gear when you are flying from water!

CONTROL INSTALLATION

Control equipment is installed in the waterproof hatch. More than enough room exists for even the largest proportional servos, receiver and batteries. The control rod installation for the rudder and elevator are detailed on the plan. Use nylon tube inside nylon tube where the rods pass through the hull, and make the bend going up to the elevator. One-sixteenth music wire can be used inside for the remaining length. This will minimize the effect of the nylon expanding and contracting. Note that the outer nylon tube is epoxied where it passes through the hull, but is left free to expand or contract as it passes through the bulkheads.

The connection from the rudder servo to the nose wheel bell crank is made inside the hatch.

The connection from the motor servo to the throttle is make using a wire-inside-nylon-tubing installation. The tube passes out of the hull in front of the leading edge of the wing. The throttle end is held by a metal clip near the motor. Use a nylon clevis for the throttle. The clip and clevis must disconnect by themselves (break free) in case of a crash where the wing is torn from the hull.

OPTIONS AND TECHNIQUES

Every scratch-builder has his own approaches to model building and this is as it should be. The comments that follow should be treated as suggestions . . . an effort by the author to pass on information that he has found useful.

It is obvious that the simplicity of the Seasquare lends itself to major variations in construction techniques. The foam approach is an obvious variation, even the hull is a natural for easy cutting. The following specific suggestions are made:

GLUE

Standard model airplane cement, such as Ambroid, Testors, or Aerogloss may be used. However, if you waterproof the insides of your model, white glue (Sig, Wilhold, Sears, Elmers, etc.) or Titebond may be used for general construction. The latter cements have ideal drying times for most construction work. In any case, if an accident occurs, drain the water out of the structure as soon as possible and allow the insides to dry thoroughly. It may be necessary to remove covering material to achieve adequate air circulation for rapid drying.

COVERING

The preferred method of covering is with silk or silk/rayon (Silray, Silron, Rayspan, etc.). Fiberglass and resin should be applied to the fore bottom and top center section of the wing (4 inches each side).

Paper (light Silkspan) may be used in place of silk on the hull sides and top, the rudder and the motor pylon.

Iron-on covering is not generally recommended for seaplanes unless special sealing techniques and care are used to assure water tightness. If water enters through a seam, it will soak into the structure and cause the model to become unbalanced. Water that enters in this manner is very slow to dry out, and permanent weakening of the structure may result.

DRILLING HOLES

Holes in balsa and plywood may be drilled using thin wall brass tubing with outside diameter equal to the hole size. File saw teeth on the edges and rotate back and forth as you push the tubing through the wood. Back the piece of wood being cut with another piece of wood to assure clean break-through

Larger tubing sizes (1/4 and up) can be sharpened on the inside before the teeth are filed. The teeth can be quite irregular without apparent loss of cutting ability.

SCREW-TYPE HOLD DOWNS

Stabs and hatches are attached using screws. It is necessary to use large washers upon the screw heads to distribute the pressure and not mash down the balsa under the screw head. An even better technique is to cut short pieces of dowel, equal in length to the thickness of the surface being held down (for 4-40 screws use 1/4 or 3/8 dowel. For 6-32 use 3/8 or 1/2 dowel. For larger screws increase the dowel diameter appropriately.). Drill a hole through the surface to be held down the diameter of the dowel and glue the dowel into this hole. The screw hole is now drilled through the dowel which, takes the place of the washer and distributes the force evenly to the surface being held down. ●